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the solutions are obvious. Our government has already made a tremendous stride in the promotion of national welfare by drafting our young men and sending them to colleges and universities for their higher mental, physical and moral training. If continued, this policy should yield a plentiful supply of well selected material for our higher scientific, professional, technical and administrative positions, imbued with proper habits and principles.

In the mobilization of our man power already developed, much could be accomplished by our great engineering and scientific societies if but given a freer hand in directing affairs affecting national welfare and in working our broad fundamental problems. They are already providing fairly well for the development and publication of scientific and technical literature and could undoubtedly take care of this and of the writing and publication of reference books. Many very valuable pieces of work have been done by individuals and committees for their organizations which would never have been undertaken by the individual alone. The societies mentioned stand between our great educational institutions and the national welfare which is the objective of higher education and it is very gratifying that they are gaining in influence in both.

The popularizing of organized knowledge and fundamental truths and vital principles of all kinds lies with our individuals of accomplishment and refined judgment. Let these be given every possible encouragement and inducement to pass on their knowledge to those less favored and less advanced.

Finally the increase of our total output all along the line through greater incentives to achievement can only come from the habitual emphasizing of those factors in productive achievement which every individual recognizes in himself. Whenever the question of whether to undertake or not to undertake arises, let us put ourselves under contract to produce certain results. To many of us the strife to increase our income or to secure the praise and respect of others are powerful factors. If we live up to but fifty per cent. of our possibilities

we shall at least double our effective output and as a nation, state or individual command the respect of others.

P. G. NUTTING

#### THE CRITERIA IN THE DECLARATION OF CHEMICAL INDEPENDENCE IN THE UNITED STATES<sup>1</sup>

The funds and knowledge and experience of every branch of scientific activity, every ounce of our strength and every grain of our intelligence have been drawn upon in the defense of our firesides and our ideals.

It was a real epoch in the history of chemistry in warfare when the Chemical Warfare Service Section was created as one of the components of our military organization. By its inception the government acknowledged and proclaimed its appreciation of science—entirely too long withheld—for never before has this country realized how indispensable a chemist is in the fabric of our modern economic conditions.

Chemistry is the criterion of a country's very existence. It is the "science of the transformation of matter" underlying all the activities of our complicated social system ever changing, and as well the untold wonders of to-morrow. This fundamental science looks into everything, focuses her light upon everything, directs our paths when the light of nature fails and "allures to brighter worlds" and leads the way. The chemist leads on—harnessing the forces of the universe to his ends, for, in the words of Kipling, "his is the earth and all that is in it." Indeed, for this reason arises the conception that national pre-eminence in chemical industry means a national world supremacy.

The chemists of America never concerned themselves with the prostitution of science, but called upon to provide our nation with the new diabolic arms of modern scientific warfare developed by a militaristic autocracy, they served ably and completely. Our eminent success is a cause of pride to every American. In

<sup>1</sup> Address delivered at the annual meeting of the Alabama Section of the American Chemical Society in Birmingham, December 7, 1918.

three years American chemical genius has done as much and as well as Germany has during three quarters of a century. This sudden unparalleled achievement will affect our chemical industry for a century. That Monday morning when the last gun was fired we passed into a new age—the beginning of an era of chemical progress, of chemical independence in this country, of research in the unfolding of the secrets of nature to make for a longer, happier life for man, of constructive productivity for the universal brotherhood of man.

The stimulus of scientific work is enormous and the growth of knowledge astounding. We have thus far reached a position of independence which might not have been attained for decades to come. Let us keep the American chemical flames a-burning, the chemical barometer a-rising. Let American chemical progress tower above all. Let us have a Declaration of Chemical Independence in this country.

Let us now consider the criteria in the development and independence—industrial and scientific—of chemistry in America.

Resultant chemical achievement seems to be the product of four factors—the college and university, the industry, the American Chemical Society, and the government.

#### THE COLLEGE AND UNIVERSITY IN THIS NEW AGE

The fundamental responsibility rests upon the college and the university—the sources of our chemists. Thorough up-to-date training is the all-important feature. The courses must be standardized and correlated—all welded into one outstanding science. Modern chemistry is getting more and more quantitative. The bonds between mathematics and physics, on the one hand, and chemistry, on the other, have been drawn closer, with the effect that physical chemistry is penetrating every phase of the science, thus widening our outlook and rendering our conceptions more precise. Developing and applying physico-chemical theory and methods, gives us insight into intricate problems and unravels mysteries. Utilizing physico-chemical interpretations in all courses means training in the chemistry of the future. Understanding the “how” of chemical trans-

formation is the only clear path to science, the true, the patient and loving interpretation of the world we live in, the laws governing it and the order and beauty revealed everywhere. Mechanical “rule-of-thumb” mastery of the principles leads one, really crammed with bookwork, to practise what in his case could only be a black art—without inspiration, without orientation. The real achievements of the hour have been brought about by men of thorough training and deep insight into the pure scientific principles. Our institutions therefore should turn out not men who know a lot—assimilators of other peoples’ ideas—but research men of creative type of thought.

Modern chemistry developed from the physico-chemical standpoint is radiating in all directions, affecting all sciences and all industries as well as its own branches. It is high time that chemists of the old schools get out of their shells, view and accelerate this growth and application of their science. As we have geological chemistry, photo-chemistry and all the other correlated chemistries with full realization of their service to man, let us stimulate more and more of this correlation not only to the pure but as well to the applied sciences and professions. Indirectly, by way of illustration of the dire need of intensive chemical training in other branches of pursuit—our physician may be put to the test. He prescribes diets and knows little or no food-chemistry. He “interprets” bio-chemical analyses and has little comprehension of physiological chemistry. He deals with the human body—a true colloid—and has not the slightest idea of colloidal chemistry. And so the story goes. Bio-chemical progress is astounding as a result of the application of chemistry to medicine. More of this coordination is needed in teaching, researching and application in every conceivable field. They all involve chemistry.

To give adequate training physical equipment of an institution is an essential efficiency factor. The real contact with the subject is in the laboratory, therefore the necessity for intensive laboratory instruction for the development of technique and systematic scientific observation and deduction.

Apropos, our institutional and industrial laboratories must foster the genuine American spirit of utilizing and encouraging domestic "Made-in-U. S." chemicals and scientific apparatus from precision instruments to filter paper.

A word in regard to a seemingly neglected corps in the service of chemistry—women. Prejudice must be overcome. They have proven to be competent workers. Chemistry is a most fitting field for women. Her natural concentration on matters of minor import, her soundness of judgment, her sense of practical realities are invaluable qualities in a laboratory worker. We must induce more women into the field.

Teachers of chemistry must be gifted with that pedagogic approach and method that will instill and stimulate the scientific spirit. Successful professors of chemistry must profess to be pedagogues as well as chemists. They are indispensable in the successful training of spirited chemists and teachers of chemistry. We must have more chemists of pedagogical training to turn out more successful teachers of chemistry. In preliminary scientific training we must concentrate as much on the methods of teaching, the logical development of the principles from the student's viewpoint, with broad-minded intensification of the far reaching applications of the principles, with greater emphasis on exact scientific expression as on the science itself. Teachers of science must stop scaring beginners away from it because of their hackneyed paraphrased modes of expression far from the student's comprehension. Science is simple clean-cut truth. We practise it daily. Every student can and will understand it if you will appeal to him on his level. Science is a living subject. Let not your language deaden it. Remember that science was not made for language but language for science. Live up to it.

Teachers of chemistry have an equally important task—the man of science is intended for research, all will admit in the light of the modern age; but in whose time and with whose money? A college or university must disseminate knowledge through research as well

as through teaching. The double task upon the professor entitles him to be relieved of worry regarding "financial modus vivendi." He is the most important person in the "post-bellum" community in emergencies, in peace and in war. To-day, no fact stands more clearly demonstrated. A soldier and an army can be made in a year, if necessary, but it takes twenty to twenty-five years to make a scientist. His salary should be commensurate with his specialization.

In a word—the great task and responsibility of the college and university to-day is to speed up our intellectual potential.

#### INDUSTRY IN CHEMICAL ADVANCEMENT

Industry has a most important bearing upon chemical advancement. In the first place, exploitation of chemists must cease. Manufacturers must learn to cooperate with their chemists whose skilled service reaps wealth and welfare to both nation and industry. Productive chemists should benefit from the fruits of their success.

Then, too, greater cooperation should be extended the investigator, the elaborator of the content of the science and its farther co-ordination. One means is by offering graduate industrial fellowships as in the Mellon Institute at Pittsburgh, where school, laboratory and practise are in harmonious heterogeneity. Another is to have an advisory staff of professors of chemistry in different specialties bearing upon the industry directly or indirectly. A third is to have each industrial corporation establish specialized research laboratories in their own plants or contribute to the organization of central institutes devoted to practical technical problems. A further urgent task upon the manufacturer is to concentrate more on and invest more capital in promoting industries essential for daily needs.

There are innumerable industries whose processes are chemical yet these manufacturers are still delving in "cook-book" procedures, ever groping in the dark. The dawn of the brighter chemistry has not struck them as yet. They are still under the false impression that science is a happy family of mutually admir-

ing absent-minded philanthropists striving for the benefit of the human race. They still fail to see the connection between science and their industry. They are not aware that the whole vista opened out by modern chemistry lays bare hitherto unsuspected depths of complexity in the most insignificant things about us. It is ignorance pure and simple and truly a curse upon the nation's advance.

Another condition that must be remedied—the engineer with little knowledge or training in chemistry in charge of the design, erection and control of chemical plants and processes. Associated with him is a routine “analyst,” entirely dependent upon him. Neither have any idea of the mechanism and interpretation of chemical processes involving mechanics, hydraulics, hydrostatics, thermodynamics, thermophysics, thermochemistry, physical chemistry and what not. Our pressing obligation, therefore is to train men more profoundly and thoroughly in the fundamental theories of the science—in mathematical, in physical, in biological as well as in the chemical branches. The industrial world to-day demands this type of broadly-trained man.

The unfounded popular craze and cry of intellectual people is for “applied science,” failing to realize that there is no applied science until you have science to apply. Pasteur propounded the wonders in bacteriology by attempting to disprove the doctrine of spontaneous generation. Helmholtz never thought of preventing eye diseases when he introduced the ophthalmoscope. Cavendish never dreamed of the double purpose of his idea of “fixing nitrogen” appearing like Brahma in two aspects—Vishna the Preserver and Siva the Destroyer. The world triumphs are indebted to pure science.

#### THE AMERICAN CHEMICAL SOCIETY IN THE SERVICE OF PROGRESS

Such being the case, our chemical associations should welcome more papers on theoretical than on “dollar” chemistry—of mutual benefit to all its members—teaching, research and technical chemists.

The American Chemical Society, the great

growing body of American chemical genius should organize a central research clearing house to receive problems for research from all conceivable sources in the country—industries, schools, research laboratories. These may be published in the journals for interested members to attack.

Then too, the question of handbooks must be settled. It is useless to continue to discuss the matter. Discussions evolve more heat than light. This is no time for talk but for action. We must have our own handbooks in English. We must stop relying on any one for anything. The time has come for independence in educational and scientific materials in this country. There is no greater body than the American Chemical Society to foster by united action this wholesome spirit of scientific independence.

#### THE GOVERNMENT'S RÔLE IN OUR CHEMICAL INDEPENDENCE

Another vitally important rôle in the establishment of chemical independence in our country must be played by our government.

To stop depending upon foreign sources of supply, our government should utilize and extend its surveys of national resources; enforce their conservation; transform sleeping villages into great centers for industrial activity; enact wise legislation for protective duties which will aid in the improvement of essential industries for daily needs; encourage the use of “Made-in-U. S.” materials; carefully consider patent legislation; establish more official experimental stations for theoretical and industrial research; build central scientific research reference libraries indispensable in research in growing industrial centers; continue through “scientific statesmen” to stimulate and encourage research; and give the chemist, the scientist his entitling share to a highly responsible position in national life and in the councils of those directing our national policies. “To him that hath shall be given.”

In the midst of all our great chemical progress, our government should concern itself with a feature of dire import—the standardization of the title “chemist.” A bottle-

washer, a laboratory assistant, an "analyst" hanging on to the coat-tails of a chemical engineer, a technician "analyzing" urine from morn to midnight, a drug clerk handling chemicals, a coffee or tea "nose" specialist—all cogs in the chemical wheel are to-day classed as chemists together with the professor of chemistry, research and industrial chemists. The title "chemist" must be standardized. Those who by right of training and occupation deserve this name should urge upon our government to lay down definite standards for the profession and place it in the same plane with medicine or law. An institution's diploma or an association's membership or whatever else may be feasible in the national standardization, should represent the chemist's license. Partial action in this direction has been inaugurated by the Chemical Warfare Service Section in classing men as "analysts" who received sufficient training in chemistry to enable them to carry on routine analyses under direction and as "chemists" who have special training in any of the branches of chemistry. This classification is a step in the right direction. It was for the war program. Now let there be a complete classification for the peace program.

To conclude—chemistry has proven to be America's bulwark of defense. In return, America must recognize all the more the indispensable service of the scholar, the thinker, the investigator of science, in national preservation. May our new democratic age stimulate scientists in their search of truth not only for truth's sake but for humanity's sake in our universal brotherhood of man.

I. NEWTON KUGELMASS

HOWARD UNIVERSITY

#### CHARLES RICHARD VAN HISE

THE following minute has been voted by the board of regents of the University of Wisconsin:

Dr. Charles Richard Van Hise, the president of the University of Wisconsin, departed this life November 19, 1918, after an unbroken connection of forty-four years with the institution, as under-

graduate, through all grades of the faculty, and as president for the past fifteen years.

Nearly every living alumnus, every faculty member and executive officer has come into intimate personal contact with him during the long period of his connection with the university, and to know him was to love him, to serve with him a privilege, and to serve under him a benediction.

Recognition of his genius, as a scientist, as an educator, and as an executive, comes to us from every quarter of the nation and civilized world. We would not here catalogue his virtues, his excellences, nor his achievements in his many fields of intellectual and personal activity. We knew him as a friend, co-laborer and associate. The many hours we have spent with him are a priceless asset; his activities and his accomplishments are an inspiration to us and a call to better things. We shall miss him as a friend, counsellor and brother; we shall strive to be better for having known him. We mourn with the family, with the university, with the nation, and with the world over his untimely passing. We deplore our loss, but we know that the world is richer for his having lived and served.

The faculty of the University of Wisconsin has drawn up the following memorial resolution in honor of President Van Hise:

We, the faculty of the university, would pay our tribute of respect and love to our departed leader, President Charles R. Van Hise. His death has afflicted us with the deepest sense of public and personal loss. We rejoice, however, in the service that he rendered to his fellow men. He preached the gospel of service, and he practised it with insight and energy. His service was not the condescension of the great to the humble, but the solicitude of the elder brother for his brethren. To him the great object in life was to release the capacities of men, to help them learn how to help themselves.

His broad conception of the part that the university should have in this work of spiritual liberation was firmly grounded in respect for pure scholarship, and his success in securing its fuller realization is one of his titles to grateful remembrance. He had a democrat's faith in the ability of the people of Wisconsin to recognize the worth of university training. No opposition, no doubts or fears, could shake his confidence in their unfaltering and full support of the university which sought to open to all a door to richer and nobler living.

He was truly a democratic leader. He was